(2) Colour

	Per cent
Monolite or Monastral V paste	10–20
Water	40–30
Glycerol	50
	100

Black stamping inks, which do not dry on the pad, such as are used by post offices, can be made from carbon black dispersed in mineral and non-drying vegetable oils; inks somewhat similar to news inks are effective. A percentage of drying oil and a little anti-skinning agent are sometimes incorporated in black stamping inks of improved rub resistance on better-quality coated papers. Such inks can be made to give little trouble on the pad and are particularly useful if a lot of copies have to be stamped in a short space of time.

Stamping inks for printing non-absorbent surfaces must be specially formulated. Dyes dissolved in methylated spirits mixed with higher alcohols for improved stability, such as butanol, glycerol, or glycol may be used. Such inks can be used for stamping tin plate, but the marks can be eradicated. For improved permanence, chemicals which attack tin, e.g. antimony chloride, may be incorporated into the ink, in which case a disposable pad is preferable. Another approach is to incorporate a small amount of resinous binder into the alcohol solvent.

Typewriter Ribbon Inks

MANUFACTURE

A typewriter ribbon is a long band, often $\frac{1}{2}$ in. wide, of tightly woven cotton fabric or else nylon. Super Nylex nylon ribbons have the horizontal strands woven flat, but the vertical strands are crimped to facilitate holding a greater amount of ink. Often the ribbons are cut from a wider cloth and the edges are sealed (to prevent fraying) with a suitable lacquer, e.g. glue, nitrocellulose, etc.

The ribbons are heavily inked, uniformly over the entire ribbon, so that they give dense letters on paper when struck by a typewriter key, yet they must be clean when handled and when the ribbon rests lightly on the typing paper.

The ribbons can be mono-colour (usually black) or bicolour (usually black and red). A bicoloured ribbon is inked in two stages; very careful alignment is essential.

The ink is applied to the ribbon on a machine by a series of rollers; the ink is fed from a trough.

The ribbon may be: (*a*) impregnated throughout, (*b*) surface treated, (*c*) inked one side only, or (*d*) inked on both sides simultaneously.

The formulation of the ink depends to some extent on the design of the inking machine.

The pigment is frequently made into a paste with petroleum jelly or a heavy mineral oil, and a natural or synthetic wax; the soluble colour, dissolved in oleic acid, being then mixed with the paste and the whole then ground thoroughly on a three-roll mill.

The ink is usually applied hot, the ink troughs being heated by hot water, steam, or electricity; in some machines oil-jacketed ink ducts are used.

A further refinement in making two-colour ribbons is the use of a centre lining machine, which automatically draws a thin insulating line on the ribbon. A transparent gum solution is pumped by air pressure through a stainless needle which prevents the colours from running.

T. H. Dixon and Co. Ltd. are one firm making machines for typewriter ribbon manufacture.

Fraying at Edges. Synthetic ribbons can be heat sealed at the edges by the use of cutting wheels that are raised to a suitable temperature electrically. The cutting disks may be mounted on a mandrel electrically heated from the inside, or may be heated individually by internal elements. Patents exist for both methods.

T. H. Dixon and Co. Ltd. have devised a spraying chamber for applying a coating to the edges of ribbons to prevent fraying.

Cotton, silk, or any non-thermoplastic ribbon after inking is placed in an open cabinet and sprayed with gum or other adhesive which is rubbed down flush with the reel when dry. Edge-sealing solutions can be made with a mixture of 30 parts of gelatine, 10 parts of glycerol and 60 parts of water; sometimes Le Page's glue is used plasticized with a little glycerol.

Le Page's glue has been used for the centre lining machine; some manufacturers prefer a solution of nitrocellulose in ethyl lactate and acetone, plasticized with benzyl benzoate or triphenyl phosphate. The solvents used in making the ribbon ink should be incompatible with those of the lining solution.

A final buffing is given before the ribbons are cut to lengths and spooled.

CHARACTERISTICS OF SINGLE-COLOUR RIBBON INKS

(1) The inks must remain permanently fluid on the ribbon, yet dry readily on typing paper.

(2) The ink must have a low yield value, good flow, and possess good wetting power for cellulosic fibres or nylon.

(3) The ink must have satisfactory 'flow back', enabling good ribbon recovery: this implies that the used portions of the ribbon must be regenerated readily with ink from unused portions by capillary flow. Recovery depends to a large extent on fine grinding, particle size, and percentage pigmentation.

(4) The ink should contain no extenders, as strong impressions are required with the minimum transfer of ink. The ink must be sufficiently concentrated for the colour not to be exhausted too rapidly.

(5) The ink should give satisfactory results consistent with limited inking of the fabric; the ribbon can carry only a certain amount of ink without smearing.

(6) The ink must have minimum viscosity change with temperature.

(7) The inked ribbon must have a long life.

NATURE OF THE VEHICLE

The vehicle must be composed of non-oxidizing and non-volatile constituents; it must not solidify or set to a gel. Glycerine, castor oil, and mineral oil are suitable; e.g. 15 per cent arachis (ground nut) oil, 15 per cent sperm oil, 70 per cent mineral oil. S. Lohrmann (*Amer. Ink Mkr.*, 1954, 32(4), 47) has discussed the use of silicone oils in typewriter ribbon inks. Wetting and dispersing agents are incorporated to improve the flow; e.g. oleic acid; rather more organic acid can be used in single-colour than in double-colour ribbons.

NATURE OF THE PIGMENTS

Soft-texture colours are selected which have small particle size, high tinctorial strength, and are readily dispersed in organic media. For black ribbons, Columbian International (Great Britain) Ltd. recommend using a really long-flowing, easily wetted black, such as 12 per cent or more Peerless, as the oils used tend to give short

inks; United Carbon Co. Inc. recommend Kosmos 15A. A dye stain solution is incorporated, not only to serve as a toner but to aid dispersion of the black and promote flow; a suitable toner is methyl violet, nigrosine, or induline, dissolved in oleic acid. I.C.I. recommend using the 'oleates' of the following dyes: Waxoline Induline 2BS or 5BS, Waxoline Victoria Blue BNS, Waxoline Violet 2BNS.

For coloured ribbons: reflex blue, Lake Red C and other soft-textured pigments might be used; I.C.I. recommend Monolite Red RMTS, Rubine Toner BS, or Bronze Scarlet CS.

A typewriter ribbon intended to produce manuscripts for photocopying must contain a component which has ultra-violet absorption; I.C.I. recommend Waxoline Orange AS.

Formulations

Black Inks

(1)

	Per cent
Carbon black	17
Nigrosine base	5
Oleic acid	25
Mineral oil	53
	100

(2)

	Per cent
Carbon black	18
Petrolatum	73
Solution: Nigrosine base 3 / in Oleic acid 6	9
	100

(3) U.S. Pat. 2,160,511

	Parts
Carbon black	6
Nigrosine base	9
Tricresyl phosphate	15
Diglycol laurate	15

Manufacture Notes

Each one of the above three inks must be ground on a three-roll mill before impregnating the ribbon.

(4) (T. Thorne Baker, *Paint Manuf.*, 1959, 29(6), 197)

	Parts
Carbon black	40
Castor oil	50
Neatsfoot oil	60
Petroleum jelly	100

After grinding thoroughly on a three-roll mill, mix with a solution of:

	Parts
Oleic acid	45
Waxoline Victoria Blue	15

Regrind on a three-roll mill.

(5) (ibid.)

	Parts
Nigrosine	10
Oleic acid	10

Mix and add to:

Carbon black	40
Petroleum jelly	160

Grind thoroughly on a three-roll mill.

(6) (ibid.)

	g.
Vaseline	20
Castor oil	10
Neatsfoot oil	10

Mix, then add:

Waxoline Victoria Blue (saturated solution)	10 ml.
Oleic acid	10 ml.
Carbon black	20 g.

Grind thoroughly on a three-roll mill.

Blue Inks

(1)

	Per cent
Blue toner	20
Lard oil	40
Castor oil	40
	100

(2)

	Per cent
Victoria Blue B	25
Neatsfoot oil	25
Oleic acid	50
	100

TWO-COLOUR TYPEWRITER RIBBON INKS

(1) The inks are applied to the ribbon at a thermostatically controlled temperature to assist fibre penetration.

(2) The flow and capillary action have to be controlled to avoid 'running'; one colour must not be permitted to migrate into the other.

(3) The respective vehicles must be dissimilar and immiscible.

(4) The colours must not bleed in either media. The pigments should be tested for moisture content, resistance to fatty acidity, bleeding, and fading.

The I.C.I. recommend using one of the non-bleeding dyes, Fastel Blue B Supra Powder and Fastel Violet R Supra Powder, with black as the second colour for bicolour ribbons.

Armour Hess Chemicals Ltd. recommend using Duomeen TDO to replace fluidizing agents such as indolin-oleate in multi-colour ribbon inks; the Duomeen TDO prevents one colour bleeding into another. Duomeen TDO is the di-oleate salt of Duomeen T $[R - NH_2C_3H_6NH_3]^{++}[C_{17}H_{33}COO]^{-}_2$.